I CLAIM:

1. A photogrammetric apparatus for capturing data on an object, comprising:

a storage device having a database;

an image capture device including an imager adapted to communicate to the database an image of the object;

bearing, range, and azimuth finding devices adapted to communicate to the database a heading, a real distance between an image plane of the imager and the object along an imager axis, and a zenith angle of a target point on the object;

an image processor adapted to measure at least one second distance between at least two of a plurality of substantially coplanar points on the object in a pixel unit of measure and at least one of real unit of measure;

wherein the image processor is further configured to be calibrated by receiving from the database and processing a calibration image having a plurality of target indicia that are a predetermined real distance apart;

wherein, to calibrate, the image processor measures in the pixel unit of measure a calibration distance between at least two of the plurality of target indicia in the calibration image and computes an average scale ratio of the predetermined real distance to the calibration distance to compute a calibrated focal length of the imager; and

whereby the image processor is thereby calibrated to compute the second distance in real units of measure.

2. The photogrammetric apparatus according to Claim 1, further including an expandable external device port assembly in electronic communication with the storage device and image processor, the external device port assembly being configured for transmitting and receiving data.

3. The photogrammetric apparatus according to Claim 1, further including a display device for viewing images from the database and at least one data input device in electronic communication with the image processor and database.

4. The photogrammetric apparatus according to Claim 1, further including a global positioning system (GPS) adapted to communicate to the database a geophysical location of the apparatus.

5. The photogrammetric apparatus according to Claim 4, wherein the image processor further computes a GPS coordinate set that corresponds to the geophysical location of the object using the processed image, the heading, the real distance, and the zenith angle stored in the database.

6. The photogrammetric apparatus according to Claim 1, wherein the image processor further calculates:

1) the at least one second distance between a first and a second selected reference point by computing the sum of an **"H1"** distance between the first reference point from a horizontal line and an **"H2"** distance between the second reference point and the horizontal line;

2) a horizontal distance **"DH"** from the focal point "f_p" to the object by multiplying the real distance **"DM"** with the sine of the zenith angle "β_s";

3) a first reference angle "$\Delta\beta_A$" from the imager axis **"IA"** to a first reference point axis defined by a line from a focal point "f_p" of the imager to the first reference point by computing the arc tangent of (a) a distance "$\mathbf{P_A}$", in the image plane and in the pixel unit of measure, between the imager axis and the first reference point axis, divided by (b) the calibrated focal length **"f"**;

4) a second reference angle "$\Delta\beta_R$" from the imager axis **"IA"** to a second reference point axis defined by a second line from the focal point of the imager to the second reference point by computing the arc tangent of (a) a distance "$\mathbf{P_R}$", in the image plane and in the pixel unit of measure, between the imager axis and the second reference point axis, divided by (b) the calibrated focal length **"f"**;

5) a first relative angle "$\mathbf{V_A}$" from the first reference point axis to the horizontal line by computing the sum of (a) the difference between ninety degrees and the zenith angle "β_s" and (b) the first reference angle "$\Delta\beta_A$";

6) a second relative angle "$\mathbf{V_R}$" from the second reference point axis to the horizontal line by computing the negative of the sum of (a) the difference between ninety degrees and the zenith angle "β_s" and (b) the second reference angle "$\Delta\beta_R$";

7) the "H1" distance by dividing the horizontal distance **"DH"** by the tangent of the first relative angle **"V_A"**; and

8) the "H2" distance by dividing the horizontal distance **"DH"** by the tangent of the second relative angle **"V_R"**.

7. The photogrammetric apparatus according to Claim 1, wherein the object in the image is selected to be a utility conductor suspended from a first utility pole and a second utility pole,

wherein the image processor further calculates:

1) a first conductor reference point elevation above a ground reference point in the at least one real unit of measure at a first conductor reference point "**C1**" on the utility conductor by computing the sum of an **"H1"** distance between the conductor reference point from a horizontal line and an **"H2"** distance between the ground reference point and the horizontal line;

2) a connection line reference point elevation above a ground reference point in the at least one real unit of measure at a connection line reference point "**C2**" on a connection line from a first conductor suspension point "**SP1**" at the first utility pole "**P1**" to a second conductor suspension point "**SP2**" at the second utility pole "**P2**" directly above the first conductor reference point "**C1**" by computing the sum of an **"H3"** distance between the connection line reference point from a horizontal line and the **"H2"** distance between the ground reference point and the horizontal line;

3) a conductor sag distance "**S**" in the at least one real unit of measure by computing the difference between the connection line reference point elevation directly above the first

conductor reference point and the first conductor reference point elevation at the first conductor reference point;

4) a horizontal distance **"DH"** from the focal point "f_p" to the object by multiplying the real distance **"DM"** with the sine of the zenith angle "β_s";

5) a first reference angle "$\Delta\beta_{A1}$" from the imager axis **"IA"** to a first conductor reference point axis defined by a line from a focal point "f_p" of the imager to the first conductor reference point by computing the arc tangent of (a) a distance "P_{A1}", in the image plane and in the pixel unit of measure, between the imager axis and the first conductor reference point axis, divided by (b) the calibrated focal length "f";

6) a second reference angle "$\Delta\beta_R$" from the imager axis **"IA"** to a ground reference point axis defined by a second line from the focal point "f_p" of the imager to the ground reference point by computing the arc tangent of (a) a distance "P_R", in the image plane and in the pixel unit of measure, between the imager axis and the ground reference point axis, divided by (b) the calibrated focal length "f";

7) a third reference angle "$\Delta\beta_{A2}$" from the imager axis **"IA"** to a connection line reference point axis defined by a line from a focal point "f_p" of the imager to the connection line reference point by computing the arc tangent of (a) a distance "P_{A2}", in the image plane and in the pixel unit of measure, between the imager axis and the connection line reference point axis, divided by (b) the calibrated focal length "f";

8) a first relative angle "V_{A1}" from the conductor reference point axis to the horizontal line by computing the sum of (a) the difference between ninety degrees and the zenith angle "β_s" and (b) the first reference angle "$\Delta\beta_{A1}$";

9) a second relative angle "$\mathbf{V_R}$" from the ground reference point axis to the horizontal line by computing the negative of the sum of (a) the difference between ninety degrees and the zenith angle "β_s" and (b) the second reference angle "$\Delta\beta_R$";

10) a third relative angle "$\mathbf{V_{A2}}$" from the connection line reference point axis to the horizontal line by computing the sum of (a) the difference between ninety degrees and the zenith angle "β_s" and (b) the first reference angle "$\Delta\beta_{A2}$";

10) the "H1" distance by dividing the horizontal distance "**DH**" by the tangent of the first relative angle "$\mathbf{V_{A1}}$";

11) the "H2" distance by dividing the horizontal distance "**DH**" by the tangent of the second relative angle "$\mathbf{V_R}$"; and

12) the "H3" distance by dividing the horizontal distance "**DH**" by the tangent of the third relative angle "$\mathbf{V_{A2}}$".

8. The photogrammetric apparatus according to Claim 1, wherein the image processor further calculates a plurality of geometric relationships between the at least two substantially coplanar points on the object using the at least one second distance and a plurality of additional second distances measured between respective additional coplanar points of the plurality of substantially coplanar points on the object.

9. The photogrammetric apparatus according to Claim 8, wherein the object in the image is selected to be a substantially cylindrical object,

wherein the image processor further calculates:

1) a diameter in the at least one real unit of measure of the substantially cylindrical object at a reference point **"A"** that is not on the image axis by multiplying (a) an image scale proximate to the reference point by (b) the at least one second distance in the pixel unit of measure, which is selected to be between one edge of the cylindrical object and an opposite edge;

2) a reference angle "$\Delta\beta_A$" from the imager axis **"IA"** to a reference point axis defined by a line from a focal point of the imager to the reference point by computing the arc tangent of (a) a distance **"P_A"**, in the image plane and in the pixel unit of measure, between the imager axis and the reference point axis, divided by (b) the calibrated focal length **"f"**;

3) a relative angle **"V_A"** from the reference point axis to the horizontal line by computing the sum of (a) the difference between ninety degrees and the zenith angle "β_s" and (b) the reference angle "$\Delta\beta_A$";

4) the image scale at the reference point **"A"** by computing the division of (a) a slope distance **"DA"** to the reference point, which is computed by division of (i) the horizontal distance to the object **"DH"** by (ii) the cosine of the relative angle **"V_A"**, by (b) a slope focal length **"f_A"** to the reference point, which is computed by division of (i) the calibrated focal length by (ii) the cosine of the reference angle "$\Delta\beta_A$".

10. A photogrammetric apparatus for capturing data on an object, comprising:

a storage device having a database;

an image capture device including an imager adapted to communicate to the database an image of the object;

bearing, range, azimuth, and global positioning system coordinate finding devices adapted to communicate to the database a heading, a real distance between an image plane of the imager and the object along an imager axis, and a zenith angle of a target point on the object;

an image processor adapted to measure at least one second distance between at least two of a plurality of substantially coplanar points on the object in a pixel unit of measure and at least one of real unit of measure;

wherein the image processor is further configured to be calibrated by receiving from the database and processing a calibration image having a plurality of target indicia that are a predetermined real distance apart;

wherein, to calibrate, the image processor measures in the pixel unit of measure a calibration distance between at least two of the plurality of target indicia in the calibration image and computes an average scale ratio of the predetermined real distance to the calibration distance to compute a calibrated focal length of the imager; and

whereby the image processor is thereby calibrated to compute the second distance in real units of measure.

11. The photogrammetric apparatus according to Claim 10, wherein the image processor further computes a GPS coordinate set that corresponds to the geophysical location of the object using the image, the heading, the real distance, and the zenith angle stored in the database.

12. The photogrammetric apparatus according to Claim 10, wherein the image processor further calculates:

1) the at least one second distance between a first and a second selected reference point by computing the sum of an **"H1"** distance between the first reference point from a horizontal line and an **"H2"** distance between the second reference point and the horizontal line;

2) a horizontal distance **"DH"** from the focal point "f_p" to the object by multiplying the real distance **"DM"** with the sine of the zenith angle **"β_s"**;

3) a first reference angle **"$\Delta\beta_A$"** from the imager axis **"IA"** to a first reference point axis defined by a line from a focal point of the imager to the first reference point by computing the arc tangent of (a) a distance **"P_A"**, in the image plane and in the pixel unit of measure, between the imager axis and the first reference point axis, divided by (b) the calibrated focal length **"f"**;

4) a second reference angle **"$\Delta\beta_R$"** from the imager axis **"IA"** to a second reference point axis defined by a second line from the focal point of the imager to the second reference point by computing the arc tangent of (a) a distance **"P_R"**, in the image plane and in the pixel unit of measure, between the imager axis and the second reference point axis, divided by (b) the calibrated focal length **"f"**;

5) a first relative angle **"V_A"** from the first reference point axis to the horizontal line by computing the sum of (a) the difference between ninety degrees and the zenith angle **"β_s"** and (b) the first reference angle **"$\Delta\beta_A$"**;

6) a second relative angle **"V_R"** from the second reference point axis to the horizontal line by computing the negative of the sum of (a) the difference between ninety degrees and the zenith angle "β_s" and (b) the second reference angle "$\Delta\beta_R$";

7) the "H1" distance by dividing the horizontal distance **"DH"** by the tangent of the first relative angle **"V_A"**; and

8) the "H2" distance by dividing the horizontal distance **"DH"** by the tangent of the second relative angle **"V_R"**.

13. The photogrammetric apparatus according to Claim 10, wherein the object in the image is selected to be a utility conductor suspended from a first utility pole and a second utility pole,

wherein the image processor further calculates:

1) a first conductor reference point elevation above a ground reference point in the at least one real unit of measure at a first conductor reference point "**C1**" on the utility conductor by computing the sum of an **"H1"** distance between the conductor reference point from a horizontal line and an **"H2"** distance between the ground reference point and the horizontal line;

2) a connection line reference point elevation above a ground reference point in the at least one real unit of measure at a connection line reference point "**C2**" on a connection line from a first conductor suspension point "**SP1**" at the first utility pole "**P1**" to a second conductor suspension point "**SP2**" at the second utility pole "**P2**" directly above the first conductor reference point "**C1**" by computing the sum of an **"H3"** distance between the connection line

reference point from a horizontal line and the **"H2"** distance between the ground reference point and the horizontal line;

3) a conductor sag distance "**S**" in the at least one real unit of measure by computing the difference between the connection line reference point elevation directly above the first conductor reference point and the first conductor reference point elevation at the first conductor reference point;

4) a horizontal distance **"DH"** from the focal point "f_p" to the object by multiplying the real distance **"DM"** with the sine of the zenith angle "β_s";

5) a first reference angle "$\Delta\beta_{A1}$" from the imager axis **"IA"** to a first conductor reference point axis defined by a line from a focal point "f_p" of the imager to the first conductor reference point by computing the arc tangent of (a) a distance "P_{A1}", in the image plane and in the pixel unit of measure, between the imager axis and the first conductor reference point axis, divided by (b) the calibrated focal length **"f"**;

6) a second reference angle "$\Delta\beta_R$" from the imager axis **"IA"** to a ground reference point axis defined by a second line from the focal point "f_p" of the imager to the ground reference point by computing the arc tangent of (a) a distance "P_R", in the image plane and in the pixel unit of measure, between the imager axis and the ground reference point axis, divided by (b) the calibrated focal length **"f"**;

7) a third reference angle "$\Delta\beta_{A2}$" from the imager axis **"IA"** to a connection line reference point axis defined by a line from a focal point "f_p" of the imager to the connection line reference point by computing the arc tangent of (a) a distance "P_{A2}", in the image plane and in

the pixel unit of measure, between the imager axis and the connection line reference point axis, divided by (b) the calibrated focal length "**f**";

8) a first relative angle "$\mathbf{V_{A1}}$" from the conductor reference point axis to the horizontal line by computing the sum of (a) the difference between ninety degrees and the zenith angle "β_s" and (b) the first reference angle "$\Delta\beta_{A1}$";

9) a second relative angle "$\mathbf{V_R}$" from the ground reference point axis to the horizontal line by computing the negative of the sum of (a) the difference between ninety degrees and the zenith angle "β_s" and (b) the second reference angle "$\Delta\beta_R$";

10) a third relative angle "$\mathbf{V_{A2}}$" from the connection line reference point axis to the horizontal line by computing the sum of (a) the difference between ninety degrees and the zenith angle "β_s" and (b) the first reference angle "$\Delta\beta_{A2}$";

10) the "H1" distance by dividing the horizontal distance "**DH**" by the tangent of the first relative angle "$\mathbf{V_{A1}}$";

11) the "H2" distance by dividing the horizontal distance "**DH**" by the tangent of the second relative angle "$\mathbf{V_R}$"; and

12) the "H3" distance by dividing the horizontal distance "**DH**" by the tangent of the third relative angle "$\mathbf{V_{A2}}$".

14. The photogrammetric apparatus according to Claim 10, wherein the image processor further calculates a plurality of geometric relationships between the at least two substantially coplanar points on the object using the at least one second distance and a plurality

of additional second distances measured between respective additional coplanar points of the plurality of substantially coplanar points on the object.

15. The photogrammetric apparatus according to Claim 14, wherein the object in the image is selected to be a substantially cylindrical object,

wherein the image processor further calculates:

1) a diameter in the at least one real unit of measure of the substantially cylindrical object at a reference point **"A"** that is not on the image axis by multiplying (a) an image scale proximate to the reference point by (b) the at least one second distance in the pixel unit of measure, which is selected to be between one edge of the cylindrical object and an opposite edge;

2) a reference angle "$\Delta\beta_A$" from the imager axis **"IA"** to a reference point axis defined by a line from a focal point of the imager to the reference point by computing the arc tangent of (a) a distance "$\mathbf{P_A}$", in the image plane and in the pixel unit of measure, between the imager axis and the reference point axis, divided by (b) the calibrated focal length **"f"**;

3) a relative angle "$\mathbf{V_A}$" from the reference point axis to the horizontal line by computing the sum of (a) the difference between ninety degrees and the zenith angle "β_s" and (b) the reference angle "$\Delta\beta_A$";

4) the image scale at the reference point **"A"** by computing the division of (a) a slope distance **"DA"** to the reference point, which is computed by division of (i) the horizontal distance to the object **"DH"** by (ii) the cosine of the relative angle "$\mathbf{V_A}$", by (b) a slope focal

length "$\mathbf{f_A}$" to the reference point, which is computed by division of (i) the calibrated focal length by (ii) the cosine of the reference angle "$\Delta\beta_A$".

16. A photogrammetric apparatus for capturing data on an object, comprising:

a storage device having a database;

an image capture device including an imager adapted to communicate to the database an image of the object;

bearing, range, and azimuth finding devices adapted to communicate to the database a heading, a real distance between an image plane of the imager and the object along an imager axis, and a zenith angle of a target point on the object;

a plurality of input and output devices in electronic communication with the database and the image processor, the plurality of devices including a display, a keyboard, and a plurality of pointing devices for identifying points on the display.

an image processor adapted to measure at least one second distance between at least two of a plurality of substantially coplanar points on the object in a pixel unit of measure and at least one of real unit of measure;

wherein the image processor is further configured to be calibrated by receiving from the database and processing a calibration image having a plurality of target indicia that are a predetermined real distance apart;

wherein, to calibrate, the image processor measures in the pixel unit of measure a calibration distance between at least two of the plurality of target indicia in the calibration image

and computes an average scale ratio of the predetermined real distance to the calibration distance to compute a calibrated focal length of the imager; and

whereby the image processor is thereby calibrated to compute the second distance in real units of measure.

17. The photogrammetric apparatus according to Claim 16, wherein the image processor further computes a GPS coordinate set that corresponds to the geophysical location of the object using the image, the heading, the real distance, and the zenith angle stored in the database.

18. The photogrammetric apparatus according to Claim 16, wherein the image processor further calculates:

1) the at least one second distance between a first and a second selected reference point by computing the sum of an **"H1"** distance between the first reference point from a horizontal line and an **"H2"** distance between the second reference point and the horizontal line;

2) a horizontal distance **"DH"** from the focal point "f_p" to the object by multiplying the real distance **"DM"** with the sine of the zenith angle "β_s";

3) a first reference angle "$\Delta\beta_A$" from the imager axis **"IA"** to a first reference point axis defined by a line from a focal point of the imager to the first reference point by computing the arc tangent of (a) a distance "P_A", in the image plane and in the pixel unit of measure, between the imager axis and the first reference point axis, divided by (b) the calibrated focal length **"f"**;

4) a second reference angle "$\Delta\beta_R$" from the imager axis "**IA**" to a second reference point axis defined by a second line from the focal point of the imager to the second reference point by computing the arc tangent of (a) a distance "$\mathbf{P_R}$", in the image plane and in the pixel unit of measure, between the imager axis and the second reference point axis, divided by (b) the calibrated focal length "**f**";

5) a first relative angle "$\mathbf{V_A}$" from the first reference point axis to the horizontal line by computing the sum of (a) the difference between ninety degrees and the zenith angle "β_s" and (b) the first reference angle "$\Delta\beta_A$";

6) a second relative angle "$\mathbf{V_R}$" from the second reference point axis to the horizontal line by computing the negative of the sum of (a) the difference between ninety degrees and the zenith angle "β_s" and (b) the second reference angle "$\Delta\beta_R$";

7) the "H1" distance by dividing the horizontal distance "**DH**" by the tangent of the first relative angle "$\mathbf{V_A}$"; and

8) the "H2" distance by dividing the horizontal distance "**DH**" by the tangent of the second relative angle "$\mathbf{V_R}$".

19. The photogrammetric apparatus according to Claim 16, wherein the object in the image is selected to be a utility conductor suspended from a first utility pole and a second utility pole,

wherein the image processor further calculates:

1) a first conductor reference point elevation above a ground reference point in the at least one real unit of measure at a first conductor reference point "**C1**" on the utility conductor

by computing the sum of an **"H1"** distance between the conductor reference point from a horizontal line and an **"H2"** distance between the ground reference point and the horizontal line;

2) a connection line reference point elevation above a ground reference point in the at least one real unit of measure at a connection line reference point "**C2**" on a connection line from a first conductor suspension point "**SP1**" at the first utility pole "**P1**" to a second conductor suspension point "**SP2**" at the second utility pole "**P2**" directly above the first conductor reference point "**C1**" by computing the sum of an **"H3"** distance between the connection line reference point from a horizontal line and the **"H2"** distance between the ground reference point and the horizontal line;

3) a conductor sag distance "**S**" in the at least one real unit of measure by computing the difference between the connection line reference point elevation directly above the first conductor reference point and the first conductor reference point elevation at the first conductor reference point;

4) a horizontal distance **"DH"** from the focal point "f_p" to the object by multiplying the real distance **"DM"** with the sine of the zenith angle "β_s";

5) a first reference angle "$\Delta\beta_{A1}$" from the imager axis **"IA"** to a first conductor reference point axis defined by a line from a focal point "f_p" of the imager to the first conductor reference point by computing the arc tangent of (a) a distance "P_{A1}", in the image plane and in the pixel unit of measure, between the imager axis and the first conductor reference point axis, divided by (b) the calibrated focal length **"f"**;

6) a second reference angle "$\Delta\beta_R$" from the imager axis **"IA"** to a ground reference point axis defined by a second line from the focal point "f_p" of the imager to the ground

reference point by computing the arc tangent of (a) a distance "$\mathbf{P_R}$", in the image plane and in the pixel unit of measure, between the imager axis and the ground reference point axis, divided by (b) the calibrated focal length "**f**";

7) a third reference angle "$\Delta\beta_{A2}$" from the imager axis "**IA**" to a connection line reference point axis defined by a line from a focal point "$\mathbf{f_p}$" of the imager to the connection line reference point by computing the arc tangent of (a) a distance "$\mathbf{P_{A2}}$", in the image plane and in the pixel unit of measure, between the imager axis and the connection line reference point axis, divided by (b) the calibrated focal length "**f**";

8) a first relative angle "$\mathbf{V_{A1}}$" from the conductor reference point axis to the horizontal line by computing the sum of (a) the difference between ninety degrees and the zenith angle "β_s" and (b) the first reference angle "$\Delta\beta_{A1}$";

9) a second relative angle "$\mathbf{V_R}$" from the ground reference point axis to the horizontal line by computing the negative of the sum of (a) the difference between ninety degrees and the zenith angle "β_s" and (b) the second reference angle "$\Delta\beta_R$";

10) a third relative angle "$\mathbf{V_{A2}}$" from the connection line reference point axis to the horizontal line by computing the sum of (a) the difference between ninety degrees and the zenith angle "β_s" and (b) the first reference angle "$\Delta\beta_{A2}$";

10) the "H1" distance by dividing the horizontal distance "**DH**" by the tangent of the first relative angle "$\mathbf{V_{A1}}$";

11) the "H2" distance by dividing the horizontal distance "**DH**" by the tangent of the second relative angle "$\mathbf{V_R}$"; and

12) the "H3" distance by dividing the horizontal distance **"DH"** by the tangent of the third relative angle **"V_{A2}"**.

20. The photogrammetric apparatus according to Claim 16, wherein the image processor further calculates a plurality of geometric relationships between the at least two substantially coplanar points on the object using the at least one second distance and a plurality of additional second distances measured between respective additional coplanar points of the plurality of substantially coplanar points on the object.

21. The photogrammetric apparatus according to Claim 20, wherein the object in the image is selected to be a substantially cylindrical object,

wherein the image processor further calculates:

1) a diameter in the at least one real unit of measure of the substantially cylindrical object at a reference point **"A"** that is not on the image axis by multiplying (a) an image scale proximate to the reference point by (b) the at least one second distance in the pixel unit of measure, which is selected to be between one edge of the cylindrical object and an opposite edge;

2) a reference angle "$\Delta\beta_A$" from the imager axis **"IA"** to a reference point axis defined by a line from a focal point of the imager to the reference point by computing the arc tangent of (a) a distance **"P_A"**, in the image plane and in the pixel unit of measure, between the imager axis and the reference point axis, divided by (b) the calibrated focal length **"f"**;

3) a relative angle "V_A" from the reference point axis to the horizontal line by computing the sum of (a) the difference between ninety degrees and the zenith angle "β_s" and (b) the reference angle "$\Delta\beta_A$";

4) the image scale at the reference point "**A**" by computing the division of (a) a slope distance "**DA**" to the reference point, which is computed by division of (i) the horizontal distance to the object "**DH**" by (ii) the cosine of the relative angle "V_A", by (b) a slope focal length "f_A" to the reference point, which is computed by division of (i) the calibrated focal length by (ii) the cosine of the reference angle "$\Delta\beta_A$".

22. A photogrammetric apparatus for capturing data on an object, comprising:

a storage device having a database;

an image capture device including an imager adapted to communicate to the database an image of the object;

bearing, range, azimuth, and global positioning system coordinate finding devices adapted to communicate to the database a heading, a real distance between an image plane of the imager and the object along an imager axis, and a zenith angle of a target point on the object;

a plurality of input and output devices in electronic communication with the database and the image processor, the plurality of devices including a display, a keyboard, and a plurality of pointing devices for identifying points on the display.

an expandable external device port assembly in electronic communication with the storage device and image processor, the external device port assembly being configured for transmitting and receiving data therewith;

an image processor adapted to measure at least one second distance between at least two of a plurality of substantially coplanar points on the object in a pixel unit of measure and at least one of real unit of measure;

wherein the image processor is further configured to be calibrated by receiving from the database and processing a calibration image having a plurality of target indicia that are a predetermined real distance apart;

wherein, to calibrate, the image processor measures in the pixel unit of measure a calibration distance between at least two of the plurality of target indicia in the calibration image and computes an average scale ratio of the predetermined real distance to the calibration distance to compute a calibrated focal length of the imager;

wherein the image processor is thereby calibrated to compute the second distance in real units of measure;

wherein the image processor computes a GPS coordinate set that corresponds to the geophysical location of the object using the image, the heading, the real distance, and the zenith angle stored in the database;

wherein the image processor further calculates:

1) the at least one second distance between a first and a second selected reference point by computing the sum of an **"H1"** distance between the first reference point from a horizontal line and an **"H2"** distance between the second reference point and the horizontal line;

2) a horizontal distance **"DH"** from the focal point "f_p" to the object by multiplying the real distance **"DM"** with the sine of the zenith angle "β_s";

3) a first reference angle "$\Delta\beta_A$" from the imager axis "**IA**" to a first reference point axis defined by a line from a focal point of the imager to the first reference point by computing the arc tangent of (a) a distance "P_A", in the image plane and in the pixel unit of measure, between the imager axis and the first reference point axis, divided by (b) the calibrated focal length "**f**";

4) a second reference angle "$\Delta\beta_R$" from the imager axis "**IA**" to a second reference point axis defined by a second line from the focal point of the imager to the second reference point by computing the arc tangent of (a) a distance "P_R", in the image plane and in the pixel unit of measure, between the imager axis and the second reference point axis, divided by (b) the calibrated focal length "**f**";

5) a first relative angle "V_A" from the first reference point axis to the horizontal line by computing the sum of (a) the difference between ninety degrees and the zenith angle "β_s" and (b) the first reference angle "$\Delta\beta_A$";

6) a second relative angle "V_R" from the second reference point axis to the horizontal line by computing the negative of the sum of (a) the difference between ninety degrees and the zenith angle "β_s" and (b) the second reference angle "$\Delta\beta_R$";

7) the "H1" distance by dividing the horizontal distance "**DH**" by the tangent of the first relative angle "V_A"; and

8) the "H2" distance by dividing the horizontal distance "**DH**" by the tangent of the second relative angle "V_R";

wherein the image processor further calculates a plurality of geometric relationships between the at least two substantially coplanar points on the object using the at least one second

distance and a plurality of additional second distances measured between respective additional coplanar points of the plurality of substantially coplanar points on the object.

23. The photogrammetric apparatus according to Claim 22, wherein the object in the image is selected to be a substantially cylindrical object, and wherein the image processor further calculates:

1) a diameter in the at least one real unit of measure of the substantially cylindrical object at a reference point **"A"** that is not on the image axis by multiplying (a) an image scale proximate to the reference point by (b) the at least one second distance in the pixel unit of measure, which is selected to be between one edge of the cylindrical object and an opposite edge;

2) a reference angle **"$\Delta\beta_A$"** from the imager axis **"IA"** to a reference point axis defined by a line from a focal point of the imager to the reference point by computing the arc tangent of (a) a distance **"P_A"**, in the image plane and in the pixel unit of measure, between the imager axis and the reference point axis, divided by (b) the calibrated focal length **"f"**;

3) a relative angle **"V_A"** from the reference point axis to the horizontal line by computing the sum of (a) the difference between ninety degrees and the zenith angle "β_s" and (b) the reference angle "$\Delta\beta_A$";

4) the image scale at the reference point **"A"** by computing the division of (a) a slope distance **"DA"** to the reference point, which is computed by division of (i) the horizontal distance to the object **"DH"** by (ii) the cosine of the relative angle **"V_A"**, by

(b) a slope focal length "$\mathbf{f_A}$" to the reference point, which is computed by division of (i) the calibrated focal length by (ii) the cosine of the reference angle "$\Delta\beta_A$".